NPS-IJWA-99-001

COORDINATION OF FLEET BATTLE EXPERIMENTATION AND JOINT EXPERIMENTATION PROGRAMS

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Naval Postgraduate School
(NPS)

The Naval Postgraduate School mission is to increase the combat effectiveness of U.S. and Allied armed forces and enhance the security of the USA through advanced education and research programs focused on the technical, analytical, and managerial tools needed to confront defense-related challenges.

Institute for Joint Warfare Analysis
(IJWA)

The Institute for Joint Warfare Analysis was founded in 1994 with the mission of addressing the problems of the joint defense arena with the academic disciplines resident at NPS. It sponsors a wide ranging research program, curriculum development focused on joint warfare, and interaction with numerous services and DoD organizations.

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COORDINATION OF FLEET BATTLE EXPERIMENTATION

AND JOINT EXPERIMENTATION PROGRAMS

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Section I. PROGRAM DESCRIPTION

I-1 PROGRAM OUTLINE

The Institute for Joint Warfare Analysis (IJWA) at the Naval Postgraduate School (NPS) is managing the data capture and analysis for Fleet Battle Experiments (FBE) Echo and Foxtrot. The Secretary of Defense has designated U. S. Atlantic Command as the Executive Agent for Joint Experimentation, chartered to explore new joint warfighting concepts and capabilities, and determine the doctrine, organization, training and education, materiel, leadership, and personnel (DOTMLP) implications for change. As such, ACOM has established the Joint Experimentation Directorate (J9) and will, among other activities, coordinate, integrate and leverage ongoing CINC, Service, and Agency experiment programs.

J9 has defined two types of experiments. USACOM "Signature" experiments are largely developed and executed by USACOM, with USACOM's objectives being primary. Leveraged experiments are CINC, Service, and Agency experiments of benefit to explore joint concepts, but USACOM's objectives are secondary to the CINC, Service or Agency objectives. Major Leveraged Events are those in which ACOM plays a major role in modifying the event to support assessment of one or more concepts, while Minor Leveraged Events envision a lesser degree of ACOM involvement. FBE-Echo and FBE-Foxtrot have been defined as Minor Leveraged Events.

The spectrum of FBE-E work with which NPS is involved includes

- Defining experiment goals
- Experiment planning
- Designing a data capture plan
- Developing and fielding the data capture team
- Managing the data capture portion of the experiment
- Archival of experiment data
- Reporting experimental data
- Analysis of the data to produce initial subjective results
- Reporting initial analyses
- Developing M&S representations of experiment events

- Analyzing experiment results to parameterize the models
- Developing MOEs for analysis of the experiments
- Analyses through simulation to determine operations effectiveness, shortfalls, and requirements
- Reporting analysis results

The NPS-J9 program for FBE-E includes those tasks above the solid line above. In addition, specifically for this project are to

- Determine which data will be appropriate for J9 concepts.
- Extract J9 specific data.
- Produce J9-tailored results from FBE-E.

The subjective analysis allows one to

- determine the success of the experiment
- identify operations successes and shortfalls
- identify process and systems strengths and shortcomings

From these results one can

- develop recommendations for process and systems improvements
- develop recommendations for future experimentation
- develop inputs for games and studies

An important aspect of this program is tailoring results to J9 program needs. Results will be placed in the context of J9 concepts and issues.

The below the line tasks will be described at the end of this introduction.

I-2 COORDINATION EVENTS AND TIMELINE

This program is a partnership with actions that must be completed by both organizations. NPS is tailoring experiment results to the needs of J9 and cannot do so without a good understanding of those needs and how a particular experiment event can produce results that address a specific J9 concept/issue. The events listed here develop that understanding and insure that the results are configured in the appropriate manner.

J9 assign a coordinator for the particular experiment

NPS assign a coordinator for the J9 portion of experiment analysis

NPS and J9 participate in experiment planning sessions

NPS and MBC develop experiment concepts and scenarios

NPS provide the experiment and data measures plan

NPS run pr-exercise simulations for experiment planning

J9 create an overlap matrix of concepts/issues and experiment data capture

NPS and J9 jointly prioritize the data capture overlap elements by considering the degree to which they meet J9 needs and the anticipated applicability of the measurement. This step will be redone shortly before the experiment if there are any changes in the experiment plan.

J9 officially OK the J9-related data capture plan as forming the basis for post-experiment reporting

J9 provide data capture guidelines and forms for cases where they wish unique data to be captured

J9 assign people to the data capture team as they feel are needed

NPS conduct the data capture during the experiment

NPS provide the after-experiment data report (subject to MBC release)

NPS provide the J9 tailored after-experiment data report

NPS provide a subjective analysis report on the experiment to include:
- assessments of the experiment elements
- results of the experiment elements
- significant lessons learned
- capabilities and performance related to the concepts being tested
- recommendations for future experimentation

NPS provide a J9-tailored subjective analysis report, includes the same elements as above

I-3 DETAILED OPERATIONS ANALYSIS

The below-the-line tasks shown above are detailed operations analysis and are currently beyond the scope of work which NPS will perform for J-9 in FBE-E. Such analyses are needed for R&D programs and are required for creation of acquisition programs. These analyses require tailoring of models so that they replicate the experiment scenarios, parameterizing the models with experiment results, and validating the models by checking their ability to replicate adequately the experiments. When this set-up has been accomplished, simulations can be run for extended conditions, and one can run many replications to perform statistical analysis. One is extending the experiment into new operational conditions and performing replications, both of which cannot be done in the field. The use of this methodology to do what-if studies is a valuable tool. Perhaps most important is using the process to determine the statistical validity of results.

An important output of the analysis process is creation of an archive of validated model scenarios. These can be reused for other studies, or easily adapted for new conditions and studies. Our intent is to create a library of experiment-validated M&S capabilities that can be used for a wide range of studies.

It is important to recognize that there are many M&S tools available, that all have their strengths and weaknesses, and that one should not fix on one tool to be used for all circumstances. Which tool to be used depends on both the situation being modeled and on the question being asked. The NPS philosophy is to use the simplest tool that will do the job and to also use the highest level of aggregation (lowest fidelity) that is appropriate for the task. This approach minimizes both the set-up effort and resulting computation time. Because of this philosophy, we maintain a large number of M&S tools in our laboratories.

The following are tasks that would be associated with post-experiment, in-depth, operations analyses. This is a cursory list, only showing an outline, not the details, of the process.

NPS and J9 choose those concepts and experiment results to be focused on for detailed analysis. It is expected that the analysis plan will be developed with ACOM/JROC needs and priorities taken into account.

NPS develop the scenario for a specific model/simulation that will be used in the analysis. The exact structure of the scenario will depend on the concept, the model, and the measures to be made.

NPS and J9 choose the appropriate MOEs and NPS insure that the analyses will produce those MOEs.

From the experiment data, parameterize the model for each scenario.

NPS run the simulations to insure that the results adequately conform to the experiment.

NPS run simulations for the specific studies desired. Obtain the desired analytic output, and report the results to J9.

NPS be prepared to support J9 reporting of the analysis results to the Joint planing and programming community.

Section II: OVERLAP BETWEEN FBE-E AND JE PROGRAMS

This section describes those parts of the two programs which overlap by listing the Joint Experimentation concepts and corresponding issues, the Fleet Battle Experiment Echo concepts and corresponding hypotheses, and presenting the overlap matrix for issues and hypotheses.

II-1 JOINT EXPERIMENTATION CONCEPTS AND ISSUES

Concepts are identified by the J9 designator Exx and their issues by Ix.

E01: Attack Ops Against Critical Mobile Targets
- I1: What levels of command are authorized to engage?
- I2: How is the OODA loop enabled to operate more quickly?

E02: Future Collaborative Info Environment
- I1: What is our capability to support the creation of a database of near real-time information concerning events in the AOR?
- I2: What is our capability to support the establishment of timeliness criteria (<1 hour) for recognition and inclusion of info in the database?

E03: Joint Contingency Force Operations
- I1: What technology(s) improved the survivability and supportability of early entry forces?

E05: Common Relevant Operational Picture
- I1: How do Marine Corps systems contribute to the COP?
- I2: What is the most efficient balance of "push" and "pull" dissemination?
- I3: How will each Service's common tactical picture interface with the COP?
- I4: Will the common operational picture facilitate flatter command structures and delegation of decision making or will it invite micro-management by senior commanders?
- I5: How can the common operational picture realistically accommodate information sharing with NGOs and PVOs?

E06: Adaptive Joint Command and Control
- I1: Will the degree of connectivity, bandwidth, and knowledge available tempt senior commanders to usurp lower-level decisions and micro-manage?
- I2: Assuming a new joint force architecture is a means with the potential to accelerate info flow and decision making, will it also increase the span of control, thus altering command relationships and organizations?
- I3: Will the advances in technology allow for the elimination of an echelon(s) of command, their associated headquarters, and support requirements?
- I4: What is the optimum balance of information push/pull for the 21st century?

E07: Interoperable Combat ID.

I1: How is CID of troops and equipment provided to prevent fratricide in an urban setting?

II-2 FLEET BATTLE EXPERIMENT-ECHO CONCEPTS AND HYPOTHESES

The concepts are grouped under the following broad categories;

A. Maritime Dominance
B. Precision Engagement/Ring of Fire
C. Full dimension Protection
D. Civil/Military Operations
E. Naval Command and Control

Under each of these is a further breakdown of the concept, labeled Ax, etc. Each is shown below. The corresponding hypotheses are labeled Hx.

A. **Maritime Dominance**

A1. Countering the Asymmetric Threat

H1: Combat swimmers can be detected by Mobile Inshore Undersea Warfare Unit (MIUWU) and other swimmer detection systems and countered by coordinated ops of the Port Security Unit.

H2: Attached mines can be located more quickly by hand-held sonar.

H3: Networked multi-sensor surveillance and response forces in layered defense can counter asymmetric small boat attacks

H4: Networked multi-sensor surveillance and response forces in layered defense can counter attacks from personal watercraft.

H5: Networked multi-sensor surveillance and response forces in layered defense can counter night attacks on anchored HVU by covert rubber boat with Sea Shadow drop-off.

H6: Networked multisensor surveillance and advanced detection and management systems can mitigate effects of asymmetric WMD attacks from low, slow flying aircraft.

H7: Networked multi-sensor surveillance and response forces in layered defense can counter night attacks on the HVU by anti-ship missiles launched from a truck which exits a known holding area and proceeds to a launching area in the hills above the harbor.

H8: Intel prep of the battlespace, advanced sensors, and networked control of CG PSU by MIUWU will allow more effective positioning and employment of the PSU against the variety of asymmetric threats.

A2. Network Centric Undersea Warfare

H1: A collaboratively developed ASW search plan improves overall search effectiveness.

H2: The use of identical, hi-fidelity models and associated databases by all ASW participants improves the overall understanding of the overall search plan and individual sensor performance. Additionally, the use of a common model

allows "drill-down" into the factors affecting performance.

H3: Time integration of the tactical undersea picture provides additional significant information for all ASW echelons compared to the tactical picture alone.

H4a: The undersea tactical picture provides sufficiently timely positional and operational information for blue force submarines to safely enable dynamic weapons exclusion zones around blue force submarines.

H4b: An ASW Joint Engagement Zone will allow more successful prosecution of an adversary submarine than the current exclusive waterspace management policy protecting blue force submarines.

H5: The sensor network and contact management capabilities of the ASW network provides an improved ability to "finger-print' and conduct all source overt or covert tracking of high interest WHITE shipping.

B. **Precision Engagement/Ring of Fire**

B1. National Assets and UAV for Fires in Support of Forces Ashore in Urban Canyons

H1: Navy UAVs in conjunction with other assets can provide effective warning and supporting fires to USMC urban operations against enemy actions beaches/streets/buildings, enemy vehicular movements, enemy infiltration in urban neighborhoods, enemy WMD in industrial area, night urban targeting, vehicular target of interest, interdiction of USMC operating areas, fixed targets of WMD interest, China Lake range targets, targets related to WMD vignette beyond Concord.

B2. Airspace Deconfliction

H1: Dynamic deconfliction techniques can provide control in limited but diverse operations.

B3. ELB Experimentation

H1: Coordination of a variety of sensors with the attacking aircraft can provide mission-essential information to the cockpit for strikes within the window of a time-critical targets and also aid the pilot in finding and hitting the target.

B4. Supporting Arms Coordination Center Exercise (SACCEX) Experimentation

H1: Digital information from LASER/GPS range-finders will allow effective GPS-guided NSFS at ranges of 18K yards using the LAWS-AFATDS-BCS linkage.

C. **Full Dimension Protection**

H1: The addition of information from civilian in-place systems can significantly improve the fused picture of air and surface conventional and asymmetric threats.

D. **Casualty Management**

D1. Comparison of casualty prediction and logistics models (MAT, FORCAS, SHIPCAS, CASEVAC)

H1: No single model contains all of the features desired for all sizes of operation but one stands out as the most appropriate for the battalion-sized operation.

D2. Medical Collaborative Logbook

H1: Medlog is a convenient system for theater level situational awareness and daily management.

D3. Multi-lingual Interview System/DARPA One Way (DOW) Computer.

H1: The DOW provides an acceptable medium for eliciting vital information from non-English speaking casualties when no local language capabilities are available.

D4. Theatre Medical Core System (TMCS)

H1: TMCS provides patient tracking on a near real-time basis and also summary OPORD Annex Q casualty management information.

D5. StatRef as field reference library on CD-ROM.

H1: StatRef is an easy to use reference to the latest procedures and treatments.

E. **Civil Military Operations**

E1. Civil Military Operations Doctrine Development.

H1: Doctrine for managing a domestic Civil Military operation through the CMOC can be developed.

E2. Consequence Management of Toxic Releases

H1: There are effective civil-military responses to the two toxic releases.

E3. Virtual Work Space

H1: A Virtual Work Space can improve the coordination between the JMC and the CMOC.

F. **Naval Command and Control**

H1: A combined Blue-Green ECOC will enhance collaboration between the staffs and allow better understanding of the commander's intent, a more complete perception of the total battlespace and more rapid staff action preparation.

II-3 OVERLAP BETWEEN FBE-E HYPOTHESES AND JE ISSUES

The following table shows the overlaps between the Joint Experimentation issues and the Fleet Battle Experiment hypotheses using a two-number prioritization scheme. The first number of the prioritization is applicability of that particular hypothesis to the JE issue, and the second number is the expected data quality for that particular purpose. 1 is the highest applicability/best quality and 3 is the lowest/poorest. A vertical line above or below a cell indicates that one or more cells have been merged.

		JOINT EXPERIMENTATION CONCEPTS														
		E01		**E02**		**E03**	**E05**					**E06**				**E07**
FBE-E		I1	I2	I1	I2	I1	I1	I2	I3	I4	I5	I1	I2	I3	I4	I1
Maritime Dominance																
Assym Threat	H1					2-2	1-3		1-3							
	H2					2-2										
	H3		|			1-2	1-2		1-2					1-2	
	H4		|			1-2	1-3		1-3					|	
	H5		|			1-2	1-3		1-3						
	H6		2-2			1-2	1-2		1-2							2-3
	H7	1-3				1-2	1-2		1-2							
	H8			1-2	2-3	1-2	1-2		1-2						2-2	2-3
NC-USW	H1						1-2		1-2			1-2	2-2	2-3	2-3	
	H2			1-2	1-2	1-2	1-3					1-2	2-2		2-3	
	H3						1-2					1-2	2-2			
	H4a															1-1
	H4b															
	H5			1-1	1-1	1-1	1-3		1-3						2-3	1-3
PE/Ring of Fire																
Nat Ass-UAV	H1	1-2	1-2	1-2	1-2	1-2	1-2	1-2				1-2			1-2	1-2
Air Deconf	H1					1-3							2-3			1-1
ELB	H1	1-3	1-3			1-3									2-3	
SACCEX	H1		2-2			1-2										
Full Dim Prot	H1			2-1	2-1	2-1			3-1							
Civ/Mil Operations																
Doctrine	H1										2-2					
Conseq Manag	H1			2-3	2-3											
Virtual WS	H1								1-2		1-2		2-2			
Naval C2	H1											1-3	1-3	1-3	2-3	2-3

Table 1. Overlap matrix of FBE-E hypotheses and JE concept issues.

Section III. DETAILS OF FBE-E HYPOTHESES/MEASURES AND CORRESPONDING JE ISSUES/SUB-ISSUES

This section lists both the Joint Experimentation issues and sub issues for which there is an overlap with Fleet Battle Experiment hypotheses. For each case where there is an overlap, the JE sub-issue and the FBE-E measurements are also listed. The result is a fairly long listing, but the result is convenient pairing of the overlaps for use by data collectors or analysts. The prioritizations are also listed for convenience.

J9-E01: ATTACK OPS AGAINST CRITICAL MOBILE TARGETS

J9-I1: What levels of command are authorized to engage?

SI1: Check with CNA/Dr. Dave Blake as a source for more info on measures pertaining to "time to respond".

SI2: Note current doctrine vs. how it will be structured for this experiment

SI3: Note if the command path/authorization levels change through the course of the experiment

SI4: Catalog the tools that enable engagement (e.g. IMMACCS, LAWS)

FBE Maritime Dominance - Countering Asymmetric Threat

[1-3] H7: Networked multi-sensor surveillance and response forces in layered defense can counter night attacks on the HVU by anti-ship missiles launched from a truck which exits a known holding area and proceeds to a launching area in the hills above the harbor.

M1: Percentage of times exit is detected

M2: Percentage of time truck is detected in logical launch position or condition before simulated launch.

FBE Precision Engagement/Ring of Fire - National Assets and UAV for Fires in Support of Forces Ashore in Urban Canyons

[1-2] H1: Navy UAVs in conjunction with other assets can provide effective warning and supporting fires to USMC urban operations against enemy actions beaches /streets/buildings, enemy vehicular movements, enemy infiltration in urban neighborhoods, enemy WMD in industrial area, night urban targeting, vehicular target of interest, interdiction of USMC operating areas, fixed targets of WMD interest, China Lake range targets, targets related to WMD vignette beyond Concord.

M1: Responsiveness of targeting to mission requests: time to detect, target and pass to shooters.

M2: Ability to derive accurate target coordinates for point precision data base within engagement time windows.

M3: Ability to build electronic target folders for major targets of interest including WMD-associated targets within windows of opportunity.

FBE Precision Engagement/Ring of Fire-ELB Experimentation

[1-3] H1: Coordination of a variety of sensors with the attacking aircraft can provide mission-essential information to the cockpit for strikes within the window of a time-critical targets and also aid the pilot in finding and hitting the target.

M1: Time to complete mission identification, planning, deconfliction and to pass target parameters to the attack aircraft.
M2: Usability of the system and role of C3F in the process.

J9-I2: How is the OODA loop enabled to operate more quickly?
SI1: Check with CNA/Dr. Dave Blake as a source for more info on measures pertaining to "time to respond"
SI2: Catalog what were the rules of engagement and how far down the Commander's Intent was pushed.

FBE Maritime Dominance - Countering Asymmetric Threat

[2-2] H6: The sensor network and contact management capabilities of the ASW network provides an improved ability to finger-print and conduct all source overt and covert tracking of high interest white shipping in support of Area defense against covertly armed shipping, counter proliferation ops, counter narcotics or other counter smuggling ops.
M1: Percentage of correct target classifications, identifications and signature correlations.
M2: Percentage of time the contact of interest was tracked while transiting the exercise/experiment area.

FBE Precision Engagement/Ring of Fire- National Assets and UAV for Fires in Support of Forces Ashore in Urban Canyons

[1-2] H1: Navy UAVs in conjunction with other assets can provide effective warning and supporting fires to USMC urban operations against enemy actions beaches /streets/buildings, enemy vehicular movements, enemy infiltration in urban neighborhoods, enemy WMD in industrial area, night urban targeting, vehicular target of interest, interdiction of USMC operating areas, fixed targets of WMD interest, China Lake range targets, targets related to WMD vignette beyond Concord.
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FBE Precision Engagement/Ring of Fire - ELB Experimentation

[1-3] H1: Coordination of a variety of sensors with the attacking aircraft can provide mission-essential information to the cockpit for strikes within the window of a time-critical targets and also aid the pilot in finding and hitting the target.
M1: Time to complete mission identification, planning, deconfliction and to pass target parameters to the attack aircraft.
M2: Usability of the system and role of C3F in the process.

FBE Precision Engagement/Ring of Fire - SACCEX

[2-2] H1: Digital information from LASER/GPS range-finders will allow effective GPS -guided NSFS at ranges of 18K yards using the LAWS-AFATDS-BCS linkage.
M1: Responsiveness
M2: Usability of the system and role of operators in the process

J9-E02: FUTURE COLLABORATIVE INFORMATION ENVIRONMENT

J9-I1: What is our capability to support the creation of a database of near real time information concerning events in the AOR?

SI1: Establish a transparent J97 "experiment within an experiment" to have a J9 individual search the Internet for open-source info and compare it against info developed by the experiment participants.

SI2: Catalog the methodology employed by experiment participants to obtain information (e.g. RFI, reachback)

FBE Maritime Dominance - Countering Asymmetric Threat

[1-2] H8: Intel prep of the battlespace, advanced sensors, and networked control of CG PSU by MIUWU will allow more effective positioning and employment of the PSU against the variety of asymmetric threats.

M1: Ratio of time to reset protective grid using MIUWU control to without reset control.

M2: Ratio of detections with IPB to that without IPB.

FBE Maritime Dominance - Network Centric Undersea Warfare

[1-2] H2: The use of identical, hi-fidelity models and associated databases by all ASW participants improves the overall understanding of the overall search plan and individual sensor performance. Additionally, the use of a common model allows "drill-down" into the factors affecting performance.

M1: Value added to the planning process and the ability to effectively employ sensors.

[1-1] H5: The sensor network and contact management capabilities of the ASW network provides an improved ability to "finger-print' and conduct all source overt or covert tracking of high interest WHITE shipping.

M1: Percentage of correct target classifications, identifications, and signature correlations.

M2: Percentage of time the contact of interest was tracked while transiting the exercise/experimental area.

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M3: Ability to build electronic target folders for major targets of interest including WMD-associated targets within windows of opportunity.

FBE Full Dimension Protection

[2-1] H1: The addition of information from civilian in-place systems can significantly improve the fused picture of air and surface conventional and asymmetric threats.

M1: Range at which a low, slow-flying threat can be detected and tracked.

M2: Range at which asymmetric surface threats can be detected.

M3: Time of warning of launch or range at which asymmetric cruise missile can be detected and engaged.

M4: Fraction of population warned of asymmetric threat.

FBE Civil Military Operations - Consequence Management of Toxic Releases

[2-3] H1: There are effective civil-military responses to the two toxic releases.

M1: Military staff and civilian subject matter experts involved in the operation rate the operations as successful.

M2: Military staff and civilian subject matter experts involved in the operation rate the information flow and response as timely.

M3: Connectivity between afloat authorities and any remote participants is rated as successful.

M4: Modeling to support the experiment was rated as successful.

J9-I2: What is our capability to support the establishment of timeliness criteria (<1 hour) for recognition and inclusion of info in the database?

SI1: Capture how long it takes our analyst to develop the information in our "experiment within an experiment"

FBE Maritime Dominance - Countering Asymmetric Threat

[2-3] H8: Intel prep of the battlespace, advanced sensors, and networked control of CG PSU by MIUWU will allow more effective positioning and employment of the PSU against the variety of asymmetric threats.

M1: Ratio of time to reset protective grid using MIUWU control to without reset control.

M2: Ratio of detections with IPB to that without IPB.

FBE Maritime Dominance - Network Centric Undersea Warfare

[1-2] H2: The use of identical, hi-fidelity models and associated databases by all ASW participants improves the overall understanding of the overall search plan and individual sensor performance. Additionally, the use of a common model allows "drill-down" into the factors affecting performance.

M1: Value added to the planning process and the ability to effectively employ sensors.

[1-1] H5: The sensor network and contact management capabilities of the ASW network provides an improved ability to "finger-print' and conduct all source overt or covert tracking of high interest WHITE shipping.

M1: Percentage of correct target classifications, identifications, and signature correlations.

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M1: Military staff and civilian subject matter experts involved in the operation rate the operations as successful.

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M3: Connectivity between afloat authorities and any remote participants is rated as successful.

M4: Modeling to support the experiment was rated as successful.

J9-E03: JOINT CONTINGENCY FORCE OPERATIONS

J9-I1: What technology(s) improved the survivability and supportability of early entry forces?

SI1: Catalog the technologies observed in the experiment

SI2: Be alert for problem areas so we can be honest broker/do reality check in our review of UW final report.

SI3: This will be the extent of our activity for this concept, no further inclusion in tailored assessment plans.

FBE Maritime Dominance - Countering Asymmetric Threat

[2-2] H1: Combat swimmers can be detected by Mobile Inshore Undersea Warfare Unit (MIUWU) and other swimmer detection systems and countered by coordinated ops of the Port Security Unit

M1: Percentage of trials in which swimmers are detected before reaching unit and range at which detected.
M2: Time from detection to prosecution of detection by response force.

[2-2] H2: Attached mines can be located more quickly by hand-held sonar.
M1: Ratio of time to locate mines attached to ship with and without sonar.
M2: Usability of the hand-held sonar.

[1-2] H3: Networked multi-sensor surveillance and response forces in layered defense can counter asymmetric small boat attacks.
M1: Ranges at which attacks are detected and at which they are declared threats.
M2: Time to initiate coordinated response to potential threat after detected/engaged.
M3: Perception of false alarms, fratricide and collateral damage risks.

[1-2] H4: Networked multi-sensor surveillance and response forces in layered defense can counter attacks from personal watercraft.
M1: Ranges at which attacks are detected and at which they are declared threats.
M2: Time to initiate coordinated response to potential threat after detected/engaged.
M3: Perception of false alarms, fratricide and collateral damage risks.

[1-2] H5: Networked multi-sensor surveillance and response forces in layered defense can counter night attacks on anchored HVU by covert rubber boat with Sea Shadow drop-off.
M1: Percentage of attacks in which warning is given by the MIUWU.
M2: Percentage of attacks that are detected by the HVU.

[1-2] H6: Networked multisensor surveillance and advanced detection and management systems can mitigate effects of asymmetric WMD attacks from low, slow flying aircraft.
M1: Ranges at which attack is detected and at which it is declared threat.
M2: Time to issue WMD warning.
M3: Time to initiate coordinated response to potential WMD threat after detected/engaged.

[1-2] H7: Networked multi-sensor surveillance and response forces in layered defense can counter night attacks on the HVU by anti-ship missiles launched from a truck which exits a known holding area and proceeds to a launching area in the hills above the harbor.
M1: Percentage of times exit is detected
M2: Percentage of time truck is detected in logical launch position or condition before simulated launch.

[1-2] H8: Intel prep of the battlespace, advanced sensors, and networked control of CG PSU by MIUWU will allow more effective positioning and employment of the PSU against the variety of asymmetric threats.
M1: Ratio of time to reset protective grid using MIUWU control to without reset control.
M2: Ratio of detections with IPB to that without IPB.

FBE Maritime Dominance - Network Centric Undersea Warfare

[1-2] H2: The use of identical, hi-fidelity models and associated databases by all ASW participants improves the overall understanding of the overall

search plan and individual sensor performance. Additionally, the use of a common model allows "drill-down" into the factors affecting performance.

M1: Value added to the planning process and the ability to effectively employ sensors.

[1-1] H5: The sensor network and contact management capabilities of the ASW network provides an improved ability to "finger-pring' and conduct all source overt or covert tracking of high interest WHITE shipping.

M1: Percentage of correct target classifications, identifications, and signature correlations.

M2: Percentage of time the contact of interest was tracked while transiting the exercise/experimental area.

FBE Precision Engagement/Ring of Fire- National Assets and UAV for Fires in Support of Forces Ashore in Urban Canyons

[1-2] H1: Navy UAVs in conjunction with other assets can provide effective warning and supporting fires to USMC urban operations against enemy actions beaches /streets/buildings, enemy vehicular movements, enemy infiltration in urban neighborhoods, enemy WMD in industrial area, night urban targeting, vehicular target of interest, interdiction of USMC operating areas, fixed targets of WMD interest, China Lake range targets, targets related to WMD vignette beyond Concord.

M1: Responsiveness of targeting to mission requests: time to detect, target and pass to shooters.

M2: Ability to derive accurate target coordinates for point precision data base within engagement time windows.

M3: Ability to build electronic target folders for major targets of interest including WMD-associated targets within windows of opportunity.

FBE Precision Engagement/Ring of Fire - Airspace Deconfliction

[1-3] H1: Dynamic deconfliction techniques can provide control in limited but diverse operations.

M1: Targets served per period.

M2: Time-sensitive targets served while in engagement window.

M3: Time to obtain dynamic deconfliction vice permission under normal TTP.

M4: Percentage of battlespace available for dynamic assignment of fires.

FBE Precision Engagement/Ring of Fire - ELB Experimentation

[1-3] H1: Coordination of a variety of sensors with the attacking aircraft can provide mission-essential information to the cockpit for strikes within the window of a time-critical targets and also aid the pilot in finding and hitting the target.

M1: Time to complete mission identification, planning, deconfliction and to pass target parameters to the attack aircraft.

M2: Usability of the system and role of C3F in the process.

FBE Precision Engagement/Ring of Fire - SACCEX Experimentation

[1-2] H1: Digital information from LASER/GPS range-finders will allow effective GPS -guided NSFS at ranges of 18K yards using the LAWS-AFATDS-BCS linkage.

M1: Responsiveness

M2: Usability of the system and role of operators in the process

FBE Full Dimension Protection

[2-1] H1: The addition of information from civilian in-place systems can significantly improve the fused picture of air and surface conventional and asymmetric threats.
M1: Range at which a low, slow-flying threat can be detected and tracked.
M2: Range at which asymmetric surface threats can be detected.
M3: Time of warning of launch or range at which asymmetric cruise missile can be detected and engaged.
M4: Fraction of population warned of asymmetric threat.

J9-E05: COMMON RELEVANT OPERATIONAL PICTURE

J9-I1: How do Marine Corps systems contribute to the COP?
SI1: Catalog any ties to the "Internet in the Sky" system
SI2: Capture whether the USMC command element came ashore or remained afloat during landings
SI3: Catalog whether COP is being disseminated via GCCS or some other system.
SI4: Catalog whether or not the troops used the new systems
SI5: Re-evaluate this issue as required based on discussion pursuant to the 05 Jan 99 IMMACCS Briefing by MCWL.

FBE Maritime Dominance - Countering Asymmetric Threat

[1-3] H1: Combat swimmers can be detected by Mobile Inshore Undersea Warfare Unit (MIUWU) and other swimmer detection systems and countered by coordinated ops of the Port Security Unit
M1: Percentage of trials in which swimmers are detected before reaching unit and range at which detected.
M2: Time from detection to prosecution of detection by response force.

[1-2] H3: Networked multi-sensor surveillance and response forces in layered defense can counter asymmetric small boat attacks.
M1: Ranges at which attacks are detected and at which they are declared threats.
M2: Time to initiate coordinated response to potential threat after detected/engaged.
M3: Perception of false alarms, fratricide and collateral damage risks.

[1-3] H4: Networked multi-sensor surveillance and response forces in layered defense can counter attacks from personal watercraft.
M1: Ranges at which attacks are detected and at which they are declared threats.
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M1: Percentage of attacks in which warning is given by the MIUWU.
M2: Percentage of attacks that are detected by the HVU.

[1-2] H6: Networked multisensor surveillance and advanced detection and management systems can mitigate effects of asymmetric WMD attacks from low, slow flying aircraft.

M1: Ranges at which attack is detected and at which it is declared threat.
M2: Time to issue WMD warning.
M3: Time to initiate coordinated response to potential WMD threat after detected/engaged.

[1-2] H7: Networked multi-sensor surveillance and response forces in layered defense can counter night attacks on the HVU by anti-ship missiles launched from a truck which exits a known holding area and proceeds to a launching area in the hills above the harbor.
M1: Percentage of times exit is detected
M2: Percentage of time truck is detected in logical launch position or condition before simulated launch.

[1-2] H8: Intel prep of the battlespace, advanced sensors, and networked control of CG PSU by MIUWU will allow more effective positioning and employment of the PSU against the variety of asymmetric threats.
M1: Ratio of time to reset protective grid using MIUWU control to without reset control.
M2: Ratio of detections with IPB to that without IPB.

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[1-2] H1: A collaboratively developed ASW search plan improves overall search effectiveness.
M1: Ratio of the integrated, predicted probability of detection for the collaboratively developed plan over the aggregated predicted probabilities of detection of the independently developed search plans.
M2: Responsiveness of collaborative planning to changes in conditions.
M3: Practicality of collaborative planning.

[1-3] H2: The use of identical, hi-fidelity models and associated databases by all ASW participants improves the overall understanding of the overall search plan and individual sensor performance. Additionally, the use of a common model allows "drill-down" into the factors affecting performance.
M1: Value added to the planning process and the ability to effectively employ sensors.

[1-2] H3: Time integration of the tactical undersea picture provides additional significant information for all ASW echelons compared to the current real-time tactical picture alone.
M1: Exploratory effort to identify the comparative Essential Elements of Information and the insights that can be gained at different ASW echelons from the time-integrated picture.

[1-3] H5: The sensor network and contact management capabilities of the ASW network provides an improved ability to "finger-print' and conduct all source overt or covert tracking of high interest WHITE shipping.
M1: Percentage of correct target classifications, identifications, and signature correlations.
M2: Percentage of time the contact of interest was tracked while transiting the exercise/experimental area.

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[1-2] H1: Navy UAVs in conjunction with other assets can provide effective warning and supporting fires to USMC urban operations against enemy actions beaches /streets/buildings, enemy vehicular movements, enemy infiltration in urban neighborhoods, enemy WMD in industrial area, night urban targeting, vehicular target of interest, interdiction of USMC operating areas, fixed targets of WMD interest, China Lake range targets, targets related to WMD vignette beyond Concord.

M1: Responsiveness of targeting to mission requests: time to detect, target and pass to shooters.

M2: Ability to derive accurate target coordinates for point precision data base within engagement time windows.

M3: Ability to build electronic target folders for major targets of interest including WMD-associated targets within windows of opportunity.

J9-I2: What is the most efficient balance of "push" and "pull" dissemination?

SI1: Determine that FBE-E and UW assessment plans address this.

SI2: Using existing FBE-E and UW assessment catalog if the info pushed up was bounded by EEIs and CCIRs.

SI3: Using existing FBE-E and UW assessment, catalog whether

FBE Precision Engagement/Ring of Fire - National Assets and UAV for Fires in Support of Forces Ashore in Urban Canyons

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M2: Ability to derive accurate target coordinates for point precision data base within engagement time windows.

M3: Ability to build electronic target folders for major targets of interest including WMD-associated targets within windows of opportunity.

J9-I3: How will each Service's common tactical picture interface with the COP?

SI1: Capture if there was just one COP and whose COP was it.

SI2: Focus on this during Monterey UW USMC landings.

FBE Maritime Dominance - Countering Asymmetric Threat

[1-3] H1: Combat swimmers can be detected by Mobile Inshore Undersea Warfare Unit (MIUWU) and other swimmer detection systems and countered by coordinated ops of the Port Security Unit

M1: Percentage of trials in which swimmers are detected before reaching unit and range at which detected.

M2: Time from detection to prosecution of detection by response force.

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layered defense can counter asymmetric small boat attacks.
M1: Ranges at which attacks are detected and at which they are declared threats.
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[1-2] H8: Intel prep of the battlespace, advanced sensors, and networked control of CG PSU by MIUWU will allow more effective positioning and employment of the PSU against the variety of asymmetric threats.
M1: Ratio of time to reset protective grid using MIUWU control to without reset control.
M2: Ratio of detections with IPB to that without IPB.

FBE Maritime Dominance - Network Centric Undersea Warfare

[1-2] H1: A collaboratively developed ASW search plan improves overall search effectiveness.
M1: Ratio of the integrated, predicted probability of detection for the collaboratively developed plan over the aggregated predicted probabilities of detection of the independently developed search plans.
M2: Responsiveness of collaborative planning.

[1-3] H5: The sensor network and contact management capabilities of the ASW network provides an improved ability to "finger-print' and conduct all source overt or covert tracking of high interest WHITE shipping.

M1: Percentage of correct target classifications, identifications, and signature correlations.
M2: Percentage of time the contact of interest was tracked while transiting the exercise/experimental area.

FBE Full Dimension Protection

[3-1] H1: The addition of information from civilian in-place systems can significantly improve the fused picture of air and surface conventional and asymmetric threats.
M1: Range at which a low, slow-flying threat can be detected and tracked.
M2: Range at which asymmetric surface threats can be detected.
M3: Time of warning of launch or range at which asymmetric cruise missile can be detected and engaged.
M4: Fraction of population warned of asymmetric threat.

FBE Civil Military Operations - Virtual Work Space

[1-2] H1: A Virtual Work Space can improve the coordination between the JMC and the CMOC.
M1: The military and civilian officials/subject matter experts rate the VWS as successful.
M2: The connectivity of the VWS is available at least 90% of the time the JMC and the CMOC are both functioning.
M3: Discussion of classified information in the JMC does not hinder operation of the VWS.

J9-I4: Will the common operational picture facilitate flatter command structures and delegation of decision making or will it invite micro-management by senior commanders?

SI1: Catalog the present command structure.
SI2: Catalog the command structure established for the experiment.
SI3: Catalog any changes to the command structure during the experiment.
SI4: Utilize questionnaire at conclusion of experiment to subordinate command levels, "Did you experience what you perceived as micromanagement?" Consider responses with respect to ROE.
SI5: Utilize questionnaire to the JTF Commander at conclusion of experiment, "Would you have changed your command structure given what you know now about the systems used in the experiment?"

[No Data Elements]

J9-I5: How can the common operational picture realistically accommodate information sharing with NGOs and PVOs?

SI1: Rely on FBE-Echo assessment plan.
SI2: Catalog how the CMOC works.
SI3: Capture how info is shared (e.g. via IMMACCS, TDL-J)

FBE Civil Military Operations - Civil Military Operations Doctrine Development.

[2-2] H1: Doctrine for managing a domestic Civil Military operation through the CMOC can be developed.
M1: Military and civilian officials involved in the doctrine development rate the operation as successful.

FBE Civil Military Operations-Virtual Work Space

[1-2] H1: A Virtual Work Space can improve the coordination between the JMC and the CMOC.

M1: The military and civilian officials/subject matter experts rate the VWS as successful.

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M3: Discussion of classified information in the JMC does not hinder operation of the VWS.

E06: ADAPTIVE JOINT COMMAND AND CONTROL

J9-I1: Will the degree of connectivity, bandwidth, and knowledge available tempt senior commanders to usurp lower-level decisions and micro-manage?

SI1: Capture if there was sufficient bandwidth available to support these systems.

SI2: Capture how limited bandwidth was handled.

SI3: Chart actual bandwidth usage, not just "either systems are working or they have failed". This requires expertise from JCSE.

FBE Maritime Dominance - Network Centric Undersea Warfare

[1-2] H1: A collaboratively developed ASW search plan improves overall search effectiveness.

M1: Ratio of the integrated, predicted probability of detection for the collaboratively developed plan over the aggregated predicted probabilities of detection of the independently developed search plans.

M2: Responsiveness of collaborative planning to changes in conditions.

M3: Practicality of collaborative planning.

[1-2] H2: The use of identical, hi-fidelity models and associated databases by all ASW participants improves the overall understanding of the overall search plan and individual sensor performance. Additionally, the use of a common model allows "drill-down" into the factors affecting performance.

M1: Value added to the planning process and the ability to effectively employ sensors.

[1-2] H3: Time integration of the tactical undersea picture provides additional significant information for all ASW echelons compared to the current real-time tactical picture alone.

M1: Exploratory effort to identify the comparative Essential Elements of Information and the insights that can be gained at different ASW echelons from the time-integrated picture.

FBE Precision Engagement/Ring of Fire - National Assets and UAV for Fires in Support of Forces Ashore in Urban Canyons

[1-2] H1: Navy UAVs in conjunction with other assets can provide effective warning and supporting fires to USMC urban operations against enemy actions beaches /streets/buildings, enemy vehicular movements, enemy infiltration in urban neighborhoods, enemy WMD in industrial area, night urban targeting, vehicular target of interest, interdiction of USMC operating areas, fixed targets of WMD interest, China Lake range targets, targets related to WMD vignette beyond Concord.

M1: Responsiveness of targeting to mission requests: time to detect, target and pass to shooters.
M2: Ability to derive accurate target coordinates for point precision data base within engagement time windows.
M3: Ability to build electronic target folders for major targets of interest including WMD-associated targets within windows of opportunity.

FBE Naval Command and Control

[1-3] H1: A combined Blue-Green ECOC will enhance collaboration between the staffs and allow better understanding of the commander's intent, a more complete perception of the total battlespace and more rapid staff action preparation.
M1: Time to complete OPTASK planning.
M2: Execution of sensor to shooter cycles within engagement windows.
M3: Usability of facilities and procedures/roles of staffs.

J9-I2: Assuming a new joint force architecture is a means with the potential to accelerate info flow and decision making, will it also increase the span of control, thus altering command relationships and organizations?

SI1: At the conclusion of the experiment ask CJTF, the Chief of Staff and each N-Staff Chief if the JTF command structure should be changed or how it would be organized given what they just witnessed in the experiment. A particular question is should N2 and N3 be combined.
SI2: Catalog whether or not senior leadership utilized the new systems offered in the experiment.

FBE Maritime Dominance - Network Centric Undersea Warfare

[2-2] H1: A collaboratively developed ASW search plan improves overall search effectiveness.
M1: Ratio of the integrated, predicted probability of detection for the collaboratively developed plan over the aggregated predicted probabilities of detection of the independently developed search plans.
M2: Responsiveness of collaborative planning to changes in conditions.
M3: Practicality of collaborative planning.

[2-2] H2: The use of identical, hi-fidelity models and associated databases by all ASW participants improves the overall understanding of the overall search plan and individual sensor performance. Additionally, the use of a common model allows "drill-down" into the factors affecting performance.
M1: Value added to the planning process and the ability to effectively employ sensors.

[2-2] H3: Time integration of the tactical undersea picture provides additional significant information for all ASW echelons compared to the current real-time tactical picture alone.
M1: Exploratory effort to identify the comparative Essential Elements of Information and the insights that can be gained at different ASW echelons from the time-integrated picture.

FBE Precision Engagement/Ring of Fire - Airspace Deconfliction

[2-3] H1: Dynamic deconfliction techniques can provide control in limited but diverse operations.
M1: Targets served per period.

M2: Time-sensitive targets served while in engagement window.
M3: Time to obtain dynamic deconfliction vice permission under normal TTP.
M4: Percentage of battlespace available for dynamic assignment of fires.

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[2-3] H1: A Virtual Work Space can improve the coordination between the JMC and the CMOC.
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M2: The connectivity of the VWS is available at least 90% of the time the JMC and the CMOC are both functioning.
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M1: Time to complete OPTASK planning.
M2: Execution of sensor to shooter cycles within engagement windows.
M3: Usability of facilities and procedures/roles of staffs.

J9-I3: Will the advances in technology allow for the elimination of an echelon(s) of command, their associated headquarters, and support requirements?

SI1: At the conclusion of the experiment ask CJTF, the Chief of Staff and each N-Staff Chief if the JTF command structure should be changed or how it would be organized given what they just witnessed in the experiment. A particular question is should N2 and N3 be combined.
SI2: Catalog whether or not senior leadership utilized the new systems offered in the experiment.

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[2-3] H1: A collaboratively developed ASW search plan improves overall search effectiveness.
M1: Ratio of the integrated, predicted probability of detection for the collaboratively developed plan over the aggregated predicted probabilities of detection of the independently developed search plans.
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[1-3] H1: A combined Blue-Green ECOC will enhance collaboration between the staffs and allow better understanding of the commander's intent, a more complete perception of the total battlespace and more rapid staff action preparation.
M1: Time to complete OPTASK planning.
M2: Execution of sensor to shooter cycles within engagement windows.
M3: Usability of facilities and procedures/roles of staffs.

J9-I4: What is the optimum balance of information push/pull for the 21st century?

SI1: Determine that FBE-E and UW assessment plans address this

SI2: Using existing FBE-E and UW assessment catalog if the info pushed up was bounded by EEIs and CCIRs.

SI3: Using existing FBE-E and UW assessment, catalog whether the Commander had the info available he desired.

FBE Maritime Dominance - Countering Asymmetric Threat

[1-2] H3: Networked multi-sensor surveillance and response forces in layered defense can counter asymmetric small boat attacks.

M1: Ranges at which attacks are detected and at which they are declared threats.

M2: Time to initiate coordinated response to potential threat after detected/engaged.

M3: Perception of false alarms, fratricide and collateral damage risks.

[2-2] H8: Intel prep of the battlespace, advanced sensors, and networked control of CG PSU by MIUWU will allow more effective positioning and employment of the PSU against the variety of asymmetric threats.

M1: Ratio of time to reset protective grid using MIUWU control to without reset control.

M2: Ratio of detections with IPB to that without IPB.

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[2-3] H1: A collaboratively developed ASW search plan improves overall search effectiveness.

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M1: Value added to the planning process and the ability to effectively employ sensors.

[2-3] H5: The sensor network and contact management capabilities of the ASW network provides an improved ability to "finger-pring' and conduct all source overt or covert tracking of high interest WHITE shipping.

M1: Percentage of correct target classifications, identifications, and signature correlations.

M2: Percentage of time the contact of interest was tracked while transiting the exercise/experimental area.

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M3: Ability to build electronic target folders for major targets of interest
including WMD-associated targets within windows of opportunity.

FBE Precision Engagement/Ring of Fire - ELB Experimentation

[2-3] H1: Coordination of a variety of sensors with the attacking aircraft can provide mission-essential information to the cockpit for strikes within the window of a time-critical targets and also aid the pilot in finding and hitting the target.
M1: Time to complete mission identification, planning, deconfliction
and to pass target parameters to the attack aircraft.
M2: Usability of the system and role of C3F in the process.

Naval Command and Control

[2-3] H1: A combined Blue-Green ECOC will enhance collaboration between the staffs and allow better understanding of the commander's intent, a more complete perception of the total battlespace and more rapid staff action preparation.
M1: Time to complete OPTASK planning.
M2: Execution of sensor to shooter cycles within engagement windows.
M3: Usability of facilities and procedures/roles of staffs.

J9-E07: INTEROPERABLE COMBAT ID.

J9-I1: How is CID of troops and equipment provided to prevent fratricide in an urban setting?

SI1: Will be determined using UW Final Report
SI2: Observers should be alert for problem areas so we can act as
honest broker/reality check in our review of final report.

FBE Maritime Dominance - Countering Asymmetric Threat

[2-3] H6: Networked multisensor surveillance and advanced detection and management systems can mitigate effects of asymmetric WMD attacks from low, slow flying aircraft.
M1: Ranges at which attack is detected and at which it is declared threat.
M2: Time to issue WMD warning.
M3: Time to initiate coordinated response to potential WMD
threat after detected/engaged.
M3: Perception of false alarms, fratricide and collateral damage risks.

[2-3] H8: Intel prep of the battlespace, advanced sensors, and networked control of CG PSU by MIUWU will allow more effective positioning and employment of the PSU against the variety of asymmetric threats.
M1: Ratio of time to reset protective grid using MIUWU
control to without reset control.
M2: Ratio of detections with IPB to that without IPB.

FBE Maritime Dominance - Network Centric Undersea Warfare

[1-1] H4: The undersea tactical picture provides sufficiently timely positional and operational information for blue force submarines to safely enable dynamic weapons exclusion zones around blue force submarines.

M1: Percentage of time that the sub was outside the dynamic weapon exclusion zone under various conditions.

[1-3] H5: The sensor network and contact management capabilities of the ASW network provides an improved ability to "finger-pring' and conduct all source overt or covert tracking of high interest WHITE shipping.

M1: Percentage of correct target classifications, identifications, and signature correlations.

M2: Percentage of time the contact of interest was tracked while transiting the exercise/experimental area.

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[1-1] H1: Dynamic deconfliction techniques can provide control in limited but diverse operations.

M1: Targets served per period.

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M3: Time to obtain dynamic deconfliction vice permission under normal TTP.

M4: Percentage of battlespace available for dynamic assignment of fires.

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[2-3] H1: A combined Blue-Green ECOC will enhance collaboration between the staffs and allow better understanding of the commander's intent, a more complete perception of the total battlespace and more rapid staff action preparation.

M1: Time to complete OPTASK planning.

M2: Execution of sensor to shooter cycles within engagement windows.

M3: Usability of facilities and procedures/roles of staffs.

IV. SUMMARY

The purpose of the program described in this report is to

1. set up a process for the Joint Experimentation Command to extract needed information from Service experiments,

2. utilize Fleet Battle Experiment Echo as a test case, and

3. obtain preliminary information from Fleet Battle Experiment Echo.

The Navy's Fleet Battle Experiments as the initial vehicle because of the Naval Postgraduate School's central role in data capture and analysis. This affords a target of opportunity to initiate this program and test its effectiveness for meeting Joint Experimentation needs.

The initial work reported here has demonstrated that it is possible to identify specific aspects of FBEs that apply to Joint Experimentation needs. This report describes the steps needed to do that identification.

The FBE data capture team has been briefed on additional J9 needs that have lead to data capture that would have not been done without this interaction. The two areas are

push versus pull for information flow, and

commander micro-management due to increased information and communication.

J9 has designed forms for obtaining the needed additional information and they have been added to the process. Insertion of this additional data capture into the plan has not been difficult or disruptive to the FBE process.

The process described here has been shown to be viable for the planning stages of an experiment. Note that the J9 involvement began fairly late in the experiment planning process. For FBE-F we will test involving J9 in the earlier stages of planning.

We have no information yet about how well results reported to J9 will contribute to the success of their program.

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